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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* SON KY QUAN, SAMUEL L. COFFMAN, BRUCE REID,  
KEITH E. NELSON, and DEBORAH A. HAGEN

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Appeal 2008-2617  
Application 09/928,737  
Technology Center 2800

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Decided: July 21, 2008

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Before CHUNG K. PAK, TERRY J. OWENS, and ROMULO H.  
DELMENDO, *Administrative Patent Judges*.

DELMENDO, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134 from a final rejection of claims 17-22 (Appeal Brief filed on August 20, 2003, hereinafter “App. Br.”). We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

Appellants state they invented a method for making semiconductor package (Specification, hereinafter “Spec.,” I, ll. 6-8).

Claims 17-22 on appeal read as follows:

17. A method for making a packaged semiconductor device comprising:

providing an interconnect substrate having a plurality of substantially identical package sites arranged in an array, the plurality of sites being separated by a singulation space;

mounting and interconnecting a semiconductor device within each site; and

overmolding a single and continuous encapsulant over each semiconductor device, the plurality of sites, and the singulation space.

18. The method of claim 17 wherein overmolding produces a top surface of the encapsulant which has a surface deviation of less than 0.13 millimeters across a length of the encapsulant.

19. The method of claim 17 wherein providing an interconnect substrate comprises providing an interconnect substrate wherein the plurality of package sites are arranged in an array of at least four by four package sites.

20. The method of claim 17 further comprising the step of singulating the plurality of package sites after overmolding.

21. The method of claim 20 wherein singulating comprises sawing through the single and continuous encapsulant and the interconnect substrate along the singulation space.

22. The method of claim 21 wherein singulating produces a plurality of packaged semiconductor devices, and further comprising the step of handling each packaged

semiconductor device with automated pick and place equipment.

The Examiner relied on the following prior art reference to reject the claims on appeal:

Tuttle	US 5,612,513	Mar. 18, 1997
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The Examiner rejected claims 17-22 as follows: (i) claims 17-21 under 35 U.S.C. § 102(b) as anticipated by Tuttle; and (ii) claim 22 under 35 U.S.C. § 103(a) as unpatentable over Tuttle (Examiner's Answer mailed Apr. 20, 2004, hereinafter "Ans.," 3-7).

#### ISSUES

Have Appellants demonstrated reversible error in the Examiner's factual finding that claims 17-21 are anticipated by Tuttle?

Have Appellants demonstrated reversible error in the Examiner's determination that the subject matter of claim 22 would have been obvious to a person having ordinary skill in the art in view of Tuttle?

#### FINDINGS OF FACT

1. Appellants have not directed us to any part of the Specification that would indicate to one of ordinary skill in the art that the claim term "overmolding" (claim 17) or "sawing" (claim 21) carries any special definition.
2. Tuttle describes a method for manufacturing an enclosed micro-circuit including the steps of: forming a flexible substrate; forming

a circuit trace on the substrate; mounting electrical components on the substrate in electrical communication with the circuit trace to form a micro-circuit; attaching a barrier to the substrate to form a cavity around the micro-circuit; and then encapsulating the micro-circuit by depositing a curable encapsulant into the cavity (col. 3, ll. 21-28).

3. According to Tuttle, “the micro-circuit can be formed as an individual unit or as part of an array that is later singulated into individual units” (col. 3, ll. 30-32).
4. Tuttle’s Figures 1 and 2 are reproduced below:

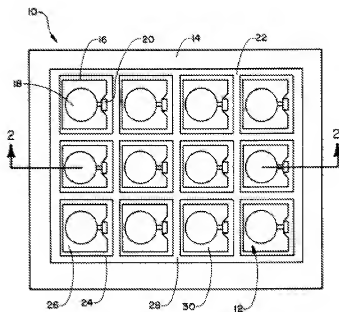


FIGURE 1

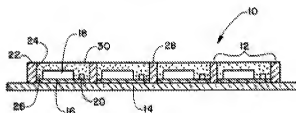


FIGURE 2

5. Tuttle's Figures 1 and 2 are said to depict a top view of an array of micro-circuits constructed in accordance with the present invention prior to singulation and a cross-sectional view along line 2-2 in Figure 1, wherein the figures show, inter alia, a circuit array 10 comprised of twelve individual circuits 12 including a battery 18 and a semiconductor die 30 disposed on a substrate 14, with one

- side of the substrate being encapsulated with an encapsulant 30 (col. 3, ll. 35-42; col. 3, l. 66 to col. 5, l. 63).
6. Tuttle states that “a particular array can have a fewer *or greater number of circuits 12*” (col. 4, ll. 4-5).
  7. Tuttle discloses that “[o]nce the encapsulant...is in its hardened state, the individual enclosed circuits...can be singulated or separated from each other by cutting, routing or shearing or other methods known in the art” (col. 6, ll. 45-48).
  8. The root term “router” in “routing” is defined as “a machine with a revolving vertical spindle and cutter for milling out the surface of wood or metal” (*Merriam-Webster’s Collegiate Dictionary* 1021 (10<sup>th</sup> ed. 1997), copy attached) .
  9. In describing another embodiment, Tuttle teaches that the encapsulant “is utilized to give each enclosed circuit 42 a substantially flat top surface” (col. 6, ll. 55-57).
  10. United States Patent 5,280,193 to Lin, cited and relied upon by Appellants (App. Br. 5-6), teaches (col. 3, ll. 30-34):

An overmolded semiconductor device is one where the encapsulating material or molding compound forms a package body only on one side of the supporting substrate for the semiconductor die.
  11. Appellants did not discuss the specific disclosures of Ouimet and Paquet, *Overmold Technology applied to Cavity Down Ultrafine Pitch PBGA Package*, Electronic Components and Technology

Conference, 458-462 (1998) (hereinafter “Ouimet”) and Tummala, *Fundamentals of Microsystems Packaging, 48<sup>th</sup> Electronic Components & Technology Conference*, 599-602 (1998) relied upon to demonstrate that “overmolding” excludes the type of encapsulation described in Tuttle.

#### PRINCIPLES OF LAW

On appeal to this Board, Appellants must show that the Examiner committed reversible error in finally rejecting the claims. *Cf. In re Kahn*, 441 F.3d 977, 985-986 (Fed. Cir. 2006) (“On appeal to the Board, an applicant can overcome a rejection by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness.”) (quoting *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998)); *see also* 37 C.F.R. § 41.37(c)(1)(vii).

“[T]o properly compare the [prior art] reference with the claims at issue, we must construe the [disputed] term...to ascertain its scope and meaning.” *In re Paulsen*, 30 F.3d 1475, 1479 (Fed. Cir. 1997).

It is well settled that the United States Patent and Trademark Office (PTO) is obligated to give claim terms their broadest reasonable interpretation, taking into account any enlightenment by way of definitions or otherwise found in the specification. *In re Icon Health and Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007) (“[T]he PTO must give claims their broadest reasonable construction consistent with the specification...Therefore, we look to the specification to see if it provides a



definition for claim terms, but otherwise apply a broad interpretation.”); *In re Bigio*, 381 F.3d 1320, 1324 (Fed. Cir. 2004)(“[T]he PTO gives a disputed claim term its broadest reasonable interpretation during patent prosecution.”).

This longstanding principle is based on the notion that “during patent prosecution when claims can be amended, ambiguities should be recognized, scope and breadth of language explored, and clarification imposed.” *In re Zletz*, 893 F.2d 319, 321 (Fed. Cir. 1989). That is, a patent applicant has the opportunity and responsibility to remove any ambiguity in claim term meaning by amending the application. “Only in this way can uncertainties of claim scope be removed, as much as possible, during the administrative process.” *In re Zletz*, 893 F.2d at 322.

“To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention, either explicitly or inherently.” *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997). Absence of a disclosure in the prior art of an inherent characteristic or function does not necessarily confer patentability. *MEHL/Biophile Int’l Corp. v. Milgraum*, 192 F.3d 1362, 1366 (Fed. Cir. 1999).

Where a prior art range entirely or substantially encompasses and does not significantly deviate from Appellants’ claimed range, the prior art may be found to anticipate. *Perricone v. Medicis Pharmaceutical Corp.*, 432 F.3d 1368, 1377 (Fed. Cir. 2005).

“Section 103 forbids issuance of a patent when ‘the differences between the subject matter sought to be patented and the prior art are such

that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.’ ” *KSR Int’l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1734 (2007).

*KSR* reaffirms the analytical framework set out in *Graham v. John Deere Co. of Kan. City*, 383 U.S. 1 (1966), which states that an objective obviousness analysis includes: (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; and (3) resolving the level of ordinary skill in the pertinent art. *KSR*, 127 S. Ct. at 1734. Secondary considerations such as commercial success, long felt but unsolved needs, or failure of others “‘might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.’” *Id.* (quoting *Graham*, 383 U.S. at 17-18).

## ANALYSIS

Appellants have argued against the Examiner’s rejections under various headings and subheadings pursuant to 37 C.F.R. § 41.37(c)(1)(vii). We address Appellants’ arguments in support of patentability accordingly.

### I. 35 U.S.C. § 102(b)

Claims 17 and 20:

Appellants’ only argument against the Examiner’s rejection of claims 17 and 20 is that Tuttle does not anticipate because it does not describe

“overmolding” (App. Br. 5-7). Specifically, Appellants contend that “Tuttle teaches a liquid dispense encapsulation process, as opposed to an overmolded encapsulation process as claimed by Appellants” (App. Br. 5).

We, like the Examiner (Ans. 6), do not find Appellants’ argument persuasive. Absent any special definition in the Specification for the term “overmolding” (Fact 1), we are obligated to give the term its broadest reasonable construction. *In re Icon Health*, 496 F.3d at 1379 (“[W]e look to the specification to see if it provides a definition for claim terms, but otherwise apply a broad interpretation.”).

As evidenced by Lin, one of the references upon which Appellants base their argument, one skilled in the relevant art would have understood that the term “overmolding” includes the type of encapsulation described in Tuttle (Facts 2-5 and 10). In particular, Lin establishes that “[a]n overmolded semiconductor device is one where the encapsulating material or molding compound forms a package body only on one side of the supporting substrate for the semiconductor die” (Fact 10). Lin places no other restrictions on the term “overmolding.” Tuttle teaches a semiconductor device in which an encapsulating material forms a package body on only one side of the supporting substrate (Facts 2-5). Thus, Tuttle describes “overmolding” as that term would be understood by one skilled in the relevant art, as evidenced by Lin.

Appellants also assert that Tummala and Ouimet contain evidence that “overmolding” does not read on Tuttle’s encapsulation (App. Br. 5-6). Other than conclusory statements, Appellants have not provided a

meaningful discussion on how and what disclosures in these references support Appellants' belief (Fact 11). While Appellants urge that Tummala "clearly differentiates a molded encapsulation process from a liquid encapsulation process" (App. Br. 6), they do not direct us to any discussion in Tummala establishing any error in the Examiner's reliance of Lin's definition of "overmolding." Indeed, Appellants do not cite to any portion of Tummala that even mentions the term "overmolding."

For these reasons, we hold that Appellants have failed to show error in the Examiner's factual finding that Tuttle describes every limitation recited in appealed claims 17 and 20.

Claim 18:

Appellants argue that Tuttle does not describe a "surface deviation of less than 0.13 millimeters across a length of the encapsulant" as recited in appealed claim 18 (App. Br. 7-8). The Examiner responds that Tuttle teaches "a substantially flat top surface" and that "[a] substantially flat top surface has about zero surface deviation" (Ans. 6; Fact 9).

We agree with Appellants that the Examiner failed to make out a *prima facie* case of *anticipation*. The Examiner has not demonstrated that Tuttle's disclosure of "substantially flat" describes, either explicitly or inherently, the claimed surface deviation with any reasonable degree of specificity as required under 35 U.S.C. § 102. Accordingly, we reverse the rejection as to claim 18.

Claim 19:

Claim 19 recites “the plurality of package sites are arranged in an array of at least four by four.” Appellants contend that “Tuttle does not disclose a four by four array” but rather “a three by four array” (App. Br. 8).

Appellants’ contention is without merit. As pointed out by the Examiner (Ans. 7), Tuttle discloses that array 12 may be greater than three by four (Fact 6). Indeed, the overlap between Appellants’ claimed range of “at least four by four” and the prior art range of greater than three by four approaches 100% - *i.e.*, these ranges are virtually identical. Because the prior art range entirely or substantially encompasses and does not significantly deviate from Appellants’ claimed range, we detect no error in the Examiner’s finding that the prior art describes every limitation recited in claim 19. *Perricone*, 432 F.3d at 1377.

While Appellants assert that Tuttle does not mention that an array with more circuits is better able to achieve a planar surface (App. Br. 9), Appellants have not directed us to any evidence (e.g., comparative experimental evidence) substantiating such result, let alone an unexpected result. Even if Appellants had done so, it does not matter that the anticipating prior art fails to appreciate an inherent characteristic of the prior art. *MEHL/Biophile*, 192 F.3d at 1366 (“Where, as here, the result is a necessary consequence of what was deliberately intended, it is of no import that the article’s authors did not appreciate the results.”).

Claim 21:

Appellants argue that Tuttle does not describe “sawing through the single and continuous encapsulant and the interconnect substrate along the singulation space” as recited in claim 19 (App. Br. 9). We cannot agree.

Appellants do not contend that the Specification contains a special definition for the term “sawing” (Fact 1). Thus, it is appropriate to give the term its broadest construction including its ordinary meaning.

Tuttle discloses that the individual enclosed circuits can be singulated by routing (Fact 7). The root term “router” in “routing” is defined as “a machine with a revolving vertical spindle and cutter for milling out the surface of wood or metal” (Fact 8). Accordingly, by disclosing “routing,” Tuttle describes “sawing.”

## II. 35 U.S.C. § 103(a)

### Claim 22:

Claim 22 recites a further step of “handling each packaged semiconductor device with automated pick and place equipment.” Appellants argue that while one of ordinary skill in the art “might [have been] motivated to use an automated process generally to increase throughput (a widespread goal of manufacturing operations), the ability to do so with the devices of Tuttle would be lacking” because Tuttle’s “non-planar surface makes it difficult to hold or pull a vacuum on the surface” (App. Br. 10; Reply Brief filed on June 21, 2004 at 4).

We find no merit in Appellants’ argument. Appellants have not directed us to any persuasive evidence (e.g., experimental evidence) that

substantiates the allegation that it is impossible to automate Tuttle's process as a result of the "substantially flat" surface described therein (Fact 9).

For this reason, we affirm the Examiner's 35 U.S.C. § 103(a) rejection of this claim.

#### CONCLUSION

On this record, we determine that Appellants have failed to demonstrate any reversible error in the Examiner's rejections of: (i) claims 17 and 19-21 as anticipated by Tuttle; and (ii) claim 22 as unpatentable over Tuttle. Appellants, however, have shown reversible error in the Examiner's rejection of claim 18 as anticipated by Tuttle.

#### DECISION

The Examiner's decision to reject appealed claims 17-22 is therefore affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

#### AFFIRMED-IN-PART

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Appeal 2008-2617  
Application 09/928,737

FREESCALE SEMICONDUCTOR, INC.  
LAW DEPARTMENT  
7700 WEST PARMER LANE MD:TX32/PL02  
AUSTIN TX 78729